BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION

In the Matter of	**)** ET Docket No. 04-186
Unlicensed Operation in the TV Broadcast	**)**
Bands	**)**
	) ET Docket No. 02-380
Additional Spectrum for Unlicensed Devices	**)**
Below 900 MHz and in the 3 GHz Band	)

ECONOMIC AND LEGAL REPLY COMMENTS OF

NEW AMERICA FOUNDATION,
MEDIA ACCESS PROJECT, FREE PRESS,
CHAMPAIGN-URBANA COMMUNITY WIRELESS PROJECT,
CENTER FOR DIGITAL DEMOCRACY, **COMMON CAUSE,**
CONSUMER FEDERATION OF AMERICA, **EDUCAUSE**,
AND PROMETHEUS RADIO PROJECT

J.H. Snider
Michael Calabrese
New America Foundation
Spectrum Policy Program
1630 Connecticut Avenue, NW
7th Floor
Washington, DC 20006
(202) 986-2700

Harold Feld
Andrew Jay Schwartzman
Media Access Project
1625 K St., NW
Suite 1118
Washington, DC 20009
(202) 232-4300
Counsel for NAF, et al.

January 31, 2005

COMMENTORS

Commentors in this proceeding include commercial providers wireless internet services using unlicensed spectrum access; and non-profit organizations using or promoting the use of unlicensed spectrum to improve education, increase broadband internet access and narrow the digital divide.

The **Champaign-Urbana Community Wireless Project**, a project of the Urbana-Champaign Independent Media Center Foundation, has deployed an extensive mesh network using Part 15 spectrum in the Champaign-Urbana metro area. The three-part mission is to (a) connect more people to Internet and broadband services; (b) develop open-source hardware and software for use by wireless projects world-wide; and, (c) build and support community-owned, not-for-profit broadband networks in cities and towns around the globe. www.cuwireless.net

The **Center for Digital Democracy** is committed to preserving the openness and diversity of the Internet in the broadband era, and to realizing the full potential of digital communications through the development and encouragement of noncommercial, public interest programming. http://www.democraticmedia.org/index.html

Common Cause is a non-partisan non-profit dedicated to holding power accountable and encouraging citizen participation in democracy. Common Cause has nearly 300,000 members and supporters throughout the country, and state organizations in 38 states. www.commoncause.org

The **Consumer Federation of America** is the nation's largest consumer advocacy group, composed of two hundred and eighty state and local affiliates representing consumer, senior, citizen, low-income, labor, farm, public power and cooperative organizations, with more than 50 million individual members. www.consumerfed.org

EDUCAUSE is a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology. Membership is open to institutions of higher education, corporations serving the higher education information technology market, and other related associations and organizations. EDUCAUSE programs include professional development activities, print and electronic publications, strategic policy initiatives, research, awards for leadership and exemplary practices, and a wealth of online information services. The current membership comprises nearly 1,900 colleges, universities, and education organizations, including more than 180 corporations, and more than 13,000 active member representatives. EDUCAUSE has offices in Boulder, Colorado, and Washington, D.C. www.educause.edu

Free Press is a national nonpartisan organization working to increase informed public participation in crucial media policy debates, and to generate policies that will

produce a more competitive and public interest-oriented media system with a strong nonprofit and noncommercial sector. www.freepress.net

Media Access Project (MAP) is a thirty year old non-profit tax exempt public interest telecommunications law firm which promotes the public's First Amendment right to hear and be heard on the electronic media of today and tomorrow. MAP's work is in the courts, the FCC, and in active outreach as a coalition builder among other public interest organizations. MAP is the only Washington-based organization devoted to representing listeners' and speakers' interests in electronic media and telecommunications issues before the Federal Communications Commission, other policy-making bodies, and in the courts.

The New America Foundation is a nonpartisan, non-profit public policy institute based in Washington, DC, which, through its Spectrum Policy Program, studies and advocates reforms to improve our nation’s management of publicly-owned assets, particularly the electromagnetic spectrum. www.newamerica.net

Prometheus Radio Project is a Philadelphia-based unincorporated collective of radio activists committed to expanding opportunities for the public to build, operate and hear low power FM radio stations. www.prometheusradio.org

TABLE OF CONTENTS

SUMMARY

Until advances in technology allowed shared access to the white spaces within the broadcast band, most notably the empty "guard bands" between stations on the TV dial, broadcasters could continue to expand their private use of public spectrum gradually, and to the benefit of themselves alone. Thus, while broadcasters have insisted on rigid protections for guard bands from Part 15 devices, broadcasters have successfully lobbied for increased power to expand operation into the guard bands and have supported manufacture of devices that directly benefit broadcasting, such as wireless microphones and other Part 74 devices.

Previously, the FCC had only two choices—allow broadcasters to expand the use of the band or let spectrum lie unused. There was therefore little harm in granting broadcasters the additional power or flexibility requested. Now, however, technology has reached a point where the Commission has other options. As the NPRM recognizes, shared access in the broadcast bands is both feasible and desirable.

Given the value of expanded guard band use to broadcasters, it is unsurprising that the MSTV/NAB comments have sought to derail the NPRM or delay shared access until after the digital transition, when broadcasters will have completed their expansion into the guard bands. The Commission must not fall into the trap urged by MSTV/NAB of waiting until after the digital transition to implement unlicensed cognitive radio sharing in the broadcast bands. To the contrary, to prevent the broadcasters from continuing their steady erosion of the guard bands for their private use, the Commission should move as quickly as possible to authorize Part 15 devices that operate in the television broadcast bands.

Part I describes the steady effort of broadcasters to expand their use of public spectrum beyond their initial allocation. **Part II** argues that, in light of new technologies that allow the public to directly access guard band spectrum to the benefit of all, to continue to transfer use of public spectrum to broadcasters without any compensation to the public would be bad policy and contrary to law. **Part III** addresses certain technical issues raised in the comments generally. Commentors urge the Commission to create the most flexible regime possible for Part 15 devices in the broadcast bands and to avoid favoring any particular technology or interference mitigation technique. As a general matter, NAF, *et al.* urge the Commission to favor low-power mobile uses over high-power fixed uses, and not to trade low-power mobile services for high-power fixed services. Furthermore, NAF, *et al.* caution the Commission against establishing any "licensing-lite" schemes or mechanisms that create a "first in time, first in right" regime that would allow a handful of actors to establish effective monopolies over geographic areas.

ARGUMENT

I. THE BROADCASTERS' COMMENTS IN THIS PROCEEDING AND THE NOI THAT PRECEDED IT REFLECT THEIR ECONOMIC INCENTIVES RATHER THAN REAL INTERFERENCE CONCERNS.

Since 1996, broadcasters have acquired approximately $6 billion in guard band spectrum[1] without any compensation to the public. *See* Appendix 7. To the extent broadcasters can win rights to the tens of billions of dollars worth of remaining white spaces, including guard band and underlay spectrum, they have a powerful economic incentive to bias engineering analyses to favor their own interests. This, and their history of allowing such economic incentives to color their analyses, casts doubt on the credibility of their engineering studies.

Consider the study submitted by the MSTV/NAB. *Comments of MSTV/NAB* Appendix I. As documented in the technical comments submitted by NAF and joined by numerous others, the experiment "proving" desensitization of analog and DTV receivers bears little resemblance to any set of circumstances likely to occur in reality. MSTV/NAB postulate a large antenna on a high power device in a home directly next to a receiver, with the receiver further made vulnerable to interference by leaving access ports unterminated or using sub-standard cable. NAF Technical Reply Comments at p.12. Any objective individual reviewing the MSTV/NAB "experiment" and comparing it with conditions found in the real world would come to the conclusion that MSTV/NAB deliberately structured the experiment to produce the least favorable results for shared spectrum access.

Constructing such an experiment has little use for those genuinely concerned with mitigating harmful interference. On the other hand, for those determined to exclude non-interfering uses so that they can continue to reap economic benefits for themselves, a strategy of creating "horror stories" makes perfect sense. Indeed, such a strategy is consistent with tactics employed by the NAB in the past.

[1] The FCC has often used the term "guard band" in a narrower sense than used here. We are using it to refer to white space including unlicensed adjacent channels, unlicensed space beyond a Grade B contour, and unlicensed space within a Grade B contour that is unusable because of natural or manmade obstacles between a licensed TV transmitter and receivers that can pick up its signal. By unlicensed in this context is simply meant unlicensed to a local TV broadcaster or anyone else. That's different from an unlicensed service such as WiFi, which anyone can use with a licensed device such as a WiFi base station.

A. Since 1996, Broadcasters Have Pursued an Aggressive Strategy of Expanding Their Operations into the Guard Bands

1. Estimates of Spectrum Returned at the End of Transition Fall Steadily Over Ten Years.

From 1995 to 1997, when broadcasters were lobbying the government for a second 6MHz channel, they told Congress that at the end of their DTV transition they would have the same amount of spectrum as they have now, so it was no giveaway. For example, hundreds of members of Congress were told the following:

> "During the transition period, broadcasters will transmit both analog and digital signals simultaneously…. Some call this a "spectrum grab"—but nothing could be further from the truth.…. **Remember: no additional spectrum is being allocated to provide ATV service** [sic; bold in the original]…. The spectrum being used for digital conversion is transitional. When the conversion is complete, broadcasters will be left with what they started, and the government will have plenty of spectrum to do with as it pleases."[2]

In other words, the 2nd channel local TV broadcasters were getting might or might not be worth the FCC's $70 billion estimate, but it didn't matter because it was all just a loan for a fixed amount of spectrum that would in any case be returned to the government.

The events of the last ten years have proved otherwise. Broadcasters have used the DTV transition as an excuse to substantially increase their spectrum guard band holdings, so that at the end of the DTV transition, instead of replicating their analog coverage, their coverage will have substantially increased.

Consider, for example, the "disappearing" spectrum problem, as estimates of returned spectrum continue to diminish. On August 16, 1995, the NAB wrote to the House and Senate Commerce Committees claiming that 200 MHz would be returned after the DTV transition. The claim was made in the form of a cover letter from Jim May, the NAB's head of government relations, accompanied by an economic study prepared for the NAB.[3] Paradoxically, the purpose of the claim was not to demonstrate how much money the government might get from auctioning the DTV spectrum, but exactly the opposite. The NAB was trying to debunk the FCC's argument that the loaned DTV channels were worth $70 billion. The way it did this was to argue that the broadcasters' DTV transition would flood the market with so much new spectrum—while leading to no increase in demand for spectrum—that the price of spectrum would

---

[2] From the NAB's Legislative Issue Papers, March 1996, October 1995, and May 1995. Legislative Issue Papers are the talking points local broadcasters use with members of Congress.

[3] The specific language was: "We anticipate that repacking could free up roughly 200 MHz of spectrum. That is, we anticipate that repacking could squeeze all ATV into half the TV spectrum." See Charles L. Jackson and John Haring, "Pitfalls in the Economic Valuation of the Electromagnetic Spectrum: Prepared for the National Association of Broadcasters," (Bethesda, Maryland: Strategic Policy Institute, July 19, 1995), p. 10.

plummet. As a result, auction receipts would not be $70 billion, but more like $2-$3 billion, with $10 billion the upper bound.

In May and September of 1995, the FCC used a different but not inconsistent figure for the amount of spectrum that would be returned. It said in its memo to Congress that "over 150 MHz of contiguous spectrum could be recaptured."[4]

On March 14, 1996, in a Congressional budget hearing, CBO analyst David Moore conservatively chose to use the 150 MHz FCC figure rather than the 200 MHz NAB figure. He also cautioned that the final return amount might be as low as 130 MHz.[5]

On April 21, 1997, in its decision to award each incumbent broadcaster a 6 MHz second channel, the FCC announced a reduced figure of 138 MHz.[6]

By February 23, 1998, the FCC announced that the figure had been reduced again; this time to 108 MHz.[7] Moreover, whereas the original plan envisaged returning the full VHF band (channels 2-13) after the DTV transition, all this was cut out. Only the least valuable of the broadcasters' spectrum, channels 52-69 (which totaled 108 MHz), would be returned.

2. Reduction In Spectrum Availability Is Directly Attributable to Increased Rights Demanded By Broadcasters.

What happened to the rest of the spectrum? Why could the NAB say 200 MHz would be returned in 1995 and ten years later claim in its comments in this proceeding that the FCC should only plan for 108 MHz to be returned?

One important change was an increase in the power levels allowed to incumbent broadcasters.[8] UHF channels, in the name of spectrum parity, were allowed to increase their power levels, guard band space permitting, from 50 kilowatts to 1,000 kilowatts. Moreover, this right could be exercised gradually, as the broadcast DTV transition unfolded. Since almost all VHF stations were part of station groups with UHF stations, this was a win-win for the great majority of broadcasters.

Other changes were implemented that favored both UHF and VHF stations. For example, interference protection for incumbents was increased from 50% of the locations 50% of the time to 50% of the locations 90% of the time, thus changing the parameters of the function (F) that specifies the licensing model from F(50,50) to F(50,90).

---

[4] Letters from Robert M. Pepper, Chief of the FCC's Office of Plans and Policy, to Senator Joseph I. Lieberman, May 5, 1995 and September 6, 1995. In the September 6 letter Pepper does not explicitly repeat the 150 MHz figure but confirms that there has been no major changes in his analysis since his last letter.

[5] Statement of David H. Moore, senior analyst in the Natural Resources and Commerce Division of the Congressional Research Service, before the Senate Committee on the Budget, March 14, 1996.

[6] FCC, Sixth Report and Order, In the Matter of Advanced Television Systems and their Impact on the Existing Broadcast Service, Docket MM 87-268, April 21, 1997.

[7] FCC, Memorandum Opinion and Order on Reconsideration of the Sixth Report and Order, In the Matter of Advanced Television Systems and their Impact on the Existing Broadcast Service, Docket MM 87-268, February 23, 1998.

[8] FCC, Memorandum Opinion and Order on Reconsideration of the Sixth Report and Order in the DTV proceeding, FCC Docket 87-268, February 18, 1998.

Not only are the parameters of the broadcasters' licensing model changing, but so is the model itself. In various proceedings, including numerous comments filed in this proceeding, there has been a push to change the nature of the model used for determining harmful interference, which determines the property rights incorporated in a broadcast license. In the analog world, rights were based on using simple contour circles radiating out from a broadcast tower. Broadcasters received licensing rights up to their outermost contour line, the Grade B contour. A problem with this approach is that lots of people within the Grade B contour, such as those behind a hill, don't actually receive a usable TV signal. In addition, many folks outside the Grade B contour but with an unobstructed line of sight to the broadcast tower, or with an unusually well-placed or sensitive receiver, can receive a signal—hence the calls for new methods of determining the outermost contour line.

One new method, the Longley-Rice Terrain Dependent Algorithm ("Longley-Rice"), as variously specified in OET Bulletins 69 and 72, is based on breaking service coverage areas into hundreds or thousands of little cells. If 50% of the locations within the cell can receive a broadcast signal 90% of the time, then the cell is deemed part of the broadcasters' coverage area. This method was adopted in the Satellite Home Viewer Improvement Act to give incumbent broadcasters exclusive rights to viewers outside their old Grade B or outermost contour. This, in turn, made it illegal for satellite companies to transmit out-of-market broadcast TV programming to folks previously out of the exclusive license area of a local TV station. This proceeding has many comments seeking to apply this interference metric to LPTV, translator, and high power TV stations, when by doing so incumbent licensees can extend their interference protection rights beyond their Grade B contour.

Looking forward, the trick for broadcasters will be to keep their theoretical spectrum rights inside the old Grade B contour, even pockets where no reception is practical, while adding as many folks as possible outside the Grade B contour. For the time being, this calls for only selectively applying the standard in situations where it will increase the broadcasters' spectrum rights. Ultimately, full conversion to the new standard may wait the coming of single frequency distributed transmission, tentatively approved in the FCC's second periodic review of the DTV transition.[9] This new right, not yet fully implemented, would allow broadcasters to place lower power broadcast towers throughout their Grade B contours, thus filling in the areas where viewers don't receive broadcast signals. In this way, broadcasters will be able to hold onto their old geographic coverage while using Longley-Rice to add to it, all under an intellectually consistent model of interference protection based on small cells rather than a single gigantic cell.

This strategy, "all the viewers I was theoretically entitled to under the old rules, and all the viewers who actually receive my signal," represents an enormous expansion of rights for broadcasters potentially worth billions of dollars. Small wonder broadcasters seek to resist any "incursion" by the public via Part 15 devices.

[9] FCC, "Second Periodic Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television," MB Docket No. 03-15, released September 7, 2004.

3. Broadcasters Have Aggressively Implemented Their Expanded Coverage Rights

During the past ten years, broadcasters have gradually been exercising the coverage rights granted to them in 1997 and revised in 1998. In 1997, when the FCC first released its channel allotments, analog and digital population coverage areas were virtually identical. When the next set of compiled public data was released in December 2004, in preparation for the broadcasters' channel election to take place on Feburary 10, 2005, the figures were quite different. For UHF stations, total geographic coverage had increased from 1996 by 46.12% and the population increased from 1996 by 32.72%, net of natural population growth. In total, excluding natural population growth, broadcasters reached 593 million more people than they did in 1996. The reason the 593 million figure is larger than the U.S. population is that the average American has access to more than 13 TV channels. For example, if all 13 channels expand their coverage areas to cover one new person, the increase in people is 13.

This data may not include the full population increase because it is incomplete. On August 3, 2004 the FCC temporarily froze applications for higher power and other modifications that would allow individual broadcasters to expand their coverage areas.[10] This was also done in preparation for the February 10, 2005 channel election. But it takes the FCC time to process station modifications, and it is usually several hundred stations behind, so the December 2004 figures were based only on station modifications already processed. When broadcasters elect their final DTV channel, beginning on February 10, 2005, they will also presumably elect either their analog or DTV channel with the greatest population coverage. Not knowing at this point in time which of their two channels they will elect suppresses the figures for average coverage and population increases. Geographic coverage expansion along the Canadian and Mexican borders has also been temporarily put on hold by those governments. Lastly, after the station election has taken place, and after the DTV transition frees up close to half the stations currently occupying channels 2-51, broadcasters will be able to seek further modifications, thus using up even more guard band space. As MSTV reminds the FCC in comments for the *Second Periodic Review*, the end of the channel election process marks merely "a new starting point; future changes in height, power, or even channel number would be permitted…."[11]

An analysis of the economic implications of this guard band expansion is given in Appendix 7. As discussed, broadcasters increased their total population coverage by 593 million as a result of modifications to their licenses.

Permitting broadcasters to take spectrum "off the table" in this fashion has imposed a significant opportunity cost on the American public, as compared to the value of spectrum access sold at auction given current market prices.[12] The basic calculation is quite simple. The current market value of unencumbered low frequency spectrum is

---

[10] FCC, "Freeze on the Filing of Certain TV and DTV Requests for Allotment or Service Area Changes," Public Notice, August 3, 2004, DA 04-2446

[11] MSTV comments, Second Periodic Review, May 6, 2004, p. 11.

[12] As discussed in the initial Comments of NAF, *et al.*, opening the band to unlicensed sharing produces far greater benefit to the American people than would auctioning spectrum. Nevertheless, auction values provide a conservative measure of the opportunity cost, since it represents the lowest value denied the public by expanding broadcaster use of the guardbands.

about $1.70/MHz-pop, as derived from the FCC's valuation of the 10 MHz of Nextel swap spectrum. The FCC valued that 10 MHz at $4.8 billion, rounded here to $5 billion (which was also Verizon's opening bid for the spectrum).[13] . Dividing $5 billion by 10 MHz yields $500 million/MHz, which divided by the U.S. population of 293 million then yields an estimate of $1.70 MHz-pop. To account for the fact that each TV channel uses 6 MHz, the estimate converts the $1.70 MHz to a 6 MHz broadcast channel, or approximately $10.20/channel-pop (6 MHz X $1.70/MHz-pop).

The value of the 593 million increase in population covered by local TV stations is therefore determined by multiplying the 593 pops by $10.20/station-pop. The result is $6 billion in opportunity cost to the American public.

By certain widely used standards, this number is too conservative. When the FCC estimated $70 billion for the value of broadcasters' 2nd channel, it used $3.61/MHz-pop figure to derive its estimate. That was the valuation of a PCS auction conducted a few months earlier.[14] In January 2001, Verizon, Sprint, and others bid over $16 billion to purchase Nextwave spectrum. The average valuation there was $4.18 /MHz-pop, with a peak of over $10/MHz-pop in New York City.[15] In other words, the market value for unencumbered low frequency spectrum is only about 40% of its recent peak of $4.18/MHz. If that peak were our $/MHz-pop figure, the value of spectrum rights acquired by broadcasters would be 2.5 times as large, which is $15 billion.

To say that the opportunity cost of the new spectrum rights given to the broadcasters is $6 billion is not to say that its current value to the broadcasters is also $6 billion. That's a very different valuation concept. The primary reason for the discrepancy between the opportunity cost of the spectrum and its use value to broadcasters is that this spectrum is currently heavily encumbered. One study, for example, has concluded that the value of a UHF station used to broadcast one analog TV channel is only about 1/20th its value if used for services most highly valued by the market, such as mobile telephone service.[16] On the other hand, since station value is determined in part by the number of customers reached (which, in turn, influences advertising rates), the value of the spectrum to each individual broadcast licensee is still quite high. Furthermore, the ability of broadcasters to use additional spectrum for ancillary services, and the consistent move toward flexibility of spectrum use for broadcasters and others, increases the value of the spectrum closer to that of unencumbered spectrum even without consideration of the value of additional viewers to licensees. Given these various factors, NAF, *et al.* suggest that use of the Commission's most recent estimate of the value for similar, unencumbered spectrum represents a sufficient approximation for the purpose of these comments: to demonstrate the economic incentive of broadcasters to protect the "white spaces" and to demonstrate the value denied the public of allowing broadcasters to continue to expand their rights at the expense of the guard bands.

---

[13] Verizon Wireless, "Valuable Spectrum Auction Would Raise Minimum $5 Billion for U.S. Treasury," Press Release, April 8, 2004

[14] Letter from Robert M. Pepper, Chief of the FCC's Office of Plans and Policy, to Senator Joseph I. Lieberman, May 5, 1995.

[15] J.H. Snider, *An Explanation of the Citizen's Guide to the Airwaves*, (Washington DC: New America Foundation, 2003), p.18.

[16] Ibid., pp. 12-26

This analysis makes no claim that the broadcasters' guard band spectrum acquisitions are complete. NAF, *et al.* estimate that the total value of the spectrum in channels 2-51, excluding 37 (a total of 294 MHz), is $147 billion, of which the broadcast industry will only have rights after the DTV transition to an average of about 14 channels (a total of 84 MHz) worth $42 billion.[17] This is derived by using the $500 million/MHz discussed above. Again, this assumes the seriously deflated spectrum prices of 2004, not the highs of 2001 or 1995. It also assumes that broadcasters will ultimately return their second, "loaned" channel. With these assumptions, the remaining guard band spectrum from channels 2-51 is worth approximately $105 billion. No one expects incumbent TV broadcasters to be able acquire all that spectrum. Moreover, technological and licensing limitations mean that most of the guard band spectrum will remain unusable for the foreseeable future. But even if the incumbent broadcast licensees can acquire only a small fraction of the guard band spectrum, it reflects a huge amount of money.

Another important qualification is that these calculations make no attempt to value the unassigned underlay rights within the broadcast bands. With the proliferation of unlicensed low power devices, these underlay rights may one day become as valuable or even more valuable than the broadcasters' current overlay rights. A major reason for not valuing underlays is that there has never been an auction of underlay rights. It is a telling figure, however, that the average American now uses far more unlicensed than licensed devices, and the proportion of unlicensed to licensed devices has been continuously increasing.[18] Another reason is that it is intrinsically hard to value underlays just as it is hard to put a value on other common assets such as public parks, waterways, and the air we breath.

4. In Addition to Direct Use of Guard Bands, Broadcasters Have Captured Use of White Space for Directly Related Technology Rather Than Permitting Broad Use by the Public.

The expansion of quasi-Part 15 devices in the broadcast bands represents a similar form of opportunity cost to the public and gain to the broadcast industry generally. Most notably, on November 13, 2002 broadcasters won the exclusive right, along with others in the TV and movie production businesses, to use low power video devices (called WAVDs) in the guard bands. These rights allow TV producers to cover an event live without having to be physically plugged into a network. For example, a portable video camera can be linked to the station via a nearby high speed Internet cable or satellite uplink in an electronic newsgathering truck.

From an economic perspective, it is difficult to understand why these Part 73 and Part 74 devices should not simply be treated as a species of Part 15 device. Such a scenario would expand use of the guard bands to the public as a whole. Instead, the broadcasting industry has been permitted to manage the public spectrum of the

[17] In his 1995 Letter, Pepper estimated an average of 13.3 local broadcast TV channels available to each person in the U.S. Since then, about 90 additional stations were licensed in small markets, so I have rounded up to 14.

[18] J.H. Snider, *An Explanation of the Citizen's Guide to the Airwaves* (Washington, DC: New America Foundation, 2003), pp. 34-35.

broadcasting bands as a private resource, expanding their own use and doling out access to allied industries rather than allowing direct access by the American public.

5. Conclusion: Broadcasters Have Strong Economic Incentives To "Protect" Guard Bands That Go Beyond Concern for Interference.

From this analysis, we can draw a number of conclusions. First, broadcasters have had and will continue to have a huge economic incentive to acquire guard band and underlay spectrum rights for themselves. Second, the economic stakes are so high that any broadcast industry sponsored technical study on the future use of this spectrum should be suspect. Third, the longer unlicensed devices are prevented from using guard bands, the more of the guard bands broadcasters will have taken and the less room there will be for unlicensed; hence, the broadcasters request to wait until after the DTV transition to allow unlicensed use should be highly suspect.

B. This Behavior Is Consistent With Past Broadcaster Behavior to Carefully Manage Public Spectrum For The Benefit of Broadcasting Incumbents.

A similar battle over white space took place in recent years in the FM radio band. New technology allowed broadcasters to expand into guard bands during the transition to digital radio. As a result, broadcasters were able to double their bandwidth from 200 kHz to 400 kHz as they acquired adjacent channels. *See generally In re Digital Audio Broadcasting systems and their impact on terrestrial broadcast service*, 17 FCCRcd 19,990 (2002). Over the years, at every opportunity, FM radio stations also have pushed the FCC to modify licenses to expand geographic areas. Others have sought to acquire free FM translator stations, with the same end in mind.

An alternative use of the FM band was to allow new low power FM stations into the guard bands. This would have increased programming diversity and competition. But the incumbent FM broadcasters were opposed to this use of the guard band space. The attack on LPFM was not framed as an economic argument that incumbent FM broadcasters would be harmed by competition and should be given the guard bands for themselves. Instead, as in this proceeding, it centered on a claim that low power FM stations would cause harmful interference to incumbent FM radio stations.

As here, the NAB constructed "studies" designed to make the case that any use of the guard bands, other than by incumbents, would cause harmful interference to the broadcast service. Professor Theodore Rappaport, the author of a highly regarded textbook on spectrum technology, strongly disputed the NAB's findings on behalf of would-be LPFM licensees. FCC engineers endorsed the Rappaport study, but the NAB succeeded in creating enough noise that Congress had political cover to ask for delay and more studies. *See FCC Public Notice Seeking Comment on Mitre Study*, 18 FCCRcd 14,445 (2003). After a $2 million dollar FCC funded Mitre study, the basic Rappaport

conclusions were reaffirmed.[19] But by then it was too late. Broadcasters had won control of the guard bands for digital radio and acquired rights to thousands of new FM translator stations where the low power FM stations could have gone.

The broadcast industry's almost identical political, economic, and engineering strategy in this fight over the TV guard band spectrum should raise eyebrows among all who care about the just and efficient use of this most valuable of information age natural resources, the low frequency spectrum.

II. NO JUSTIFICATION EXISTS FOR FURTHER EXPANSION OF BROADCASTER ACCESS TO WHITE SPACE AT THE EXPENSE OF UNLICENSED SERVICE

Prior to the development of new technologies that allowed efficient spectrum sharing on a non-interfering basis, the FCC's decision to allow broadcasters to expand their use of the guard bands was justifiable as an exercise in spectrum efficiency. Under the old logic, since only broadcasters could safely use the spectrum, it served the public interest to expand broadcaster access to the spectrum. This logic no longer holds true.

The FCC has tentatively concluded in the NPRM that it can facilitate use of this valuable spectrum by the general public, rather than rely exclusively on expanding the rights of existing licensees. Accordingly, the Communications Act requires the FCC to carefully weigh the opportunity cost of allowing broadcasters to expand their own access to spectrum, when such expanded access would deprive the public of the ability to use the spectrum pursuant to Part 15.

A. The broadcast industry's endless requests to warehouse their existing spectrum holdings and win new rights to guard band spectrum are creating uncertainty and slowing down the DTV transition.

During the past ten years, broadcasters have continuously petitioned the FCC to slow the buildout of DTV facilities, thus warehousing guard band spectrum (see Appendix 3). This includes delaying the construction of facilities, operating at power levels that only cover a fraction of their area of license, operating only a fraction of the hours of their analog station, and using only a small fraction of the bits the FCC awarded them. When these three factors are combined—space (% of population covered), time (% of the day the station is actually transmitting DTV), and bit rate (% of the 19.4 mbps bit stream the broadcasters are actually using to send out content)—broadcasters continued to warehouse as much as 90% of their spectrum in 2004. Since the FCC compiles no information on broadcasters' spectrum warehousing, as long as minimum requirements are met, these numbers are especially difficult to estimate.[20]

---

[19] See Mitre, "Experimental Measurements of the Third-Adjacent Channel Impacts of Low-Power Fm Stations," (McClean, VA: Mitre, May 2003). See also "Broadcast," *Communications Daily*, February 24, 2004, and "Broadcast," *Communications Daily*, June 7, 2004.

[20] For example, let's assume a broadcaster only broadcasts 3 SDTV or one HDTV programming stream. That would require only half (50%) the 19.4 mbps bit stream. Let's assume the broadcaster operates at power levels reaching only half (50%) its population. And let's assume it the broadcaster only operates

At the same time, broadcasters have continuously petitioned the FCC for rights to better spectrum, more coverage rights, and new broadcast DTV standards that disenfranchise early adopters, thus discouraging the purchase of DTV receivers[21] as smart consumers defer purchasing equipment that will soon become obsolete.

These actions, not the proposed introduction of unlicensed service, are the major source of change and uncertainty in the broadcast band. The DTV transition is delayed not because of unlicensed service but because it has been in the interest of the broadcast industry to delay it. In contrast, Berlin, Germany transitioned to broadcast DTV in 9 months—and with far fewer broadcast industry subsidies.[22] Lack of unlicensed service in guard band and underlay spectrum cannot explain this difference in outcome.

B. The protected contour lines of TV stations on channels from 2-69 should be frozen, with no more license modifications given that expand population coverage without public compensation.

Since 1996, UHF broadcasters have increased their geographic coverage area by 32.72% and their population coverage, net of natural population increase, by 32.72%. Across both UHF and VHF stations, the total geographic increase has been 22.22% and population increase, net of natural population increase, 24.38%. This process is expected to continue until after the DTV transition, when many channels will free up and the process of "maximization" can reach a new plateau. Until the FCC has estimated the opportunity cost of this spectrum giveaway, it should desist from giving more away, which reduces the amount of spectrum available for unlicensed service.

C. The FCC should immediately rule that it will not grant interference protection to any TV receiver outside a Grade B contour line that relies on special configurations, such as high towers, and directional, high-gain antennas, to receive broadcast signals.

In addition to the push to implement Longley-Rice geographic expansion of contour lines, there has been another, even more controversial approach advocated to protect incumbent licensee rights beyond their Grade B contour. Some translator and cable companies use elevated, directional, and highly sensitive receivers to pick up TV signals outside the Grade B contours of nearby TV markets. Some rural viewers also put up similar antennas to receive distant signals. Some of these entities might lose TV service if they are not protected from unlicensed use of the guard band outside the Grade

---

during prime time (less than 25% of the broadcast day). That would imply that the broadcaster is warehousing 15/16 of its spectrum.

[21] DTV receivers are differentiated from DTV sets, with a DTV set used for any type of DTV signal, including satellite, cable, and DVD; and a DTV receiver only used to pick up a DTV over-the-air signal. Obviously, with DTV broadcast tuners now being mandatory, consumer choice in this matter is lessened.

[22] J.H. Snider and Michael Calabrese, "Speeding the DTV Transition: A Consumer Tax Credit Can Unplug Analog TV, Reduce the Deficit and Redeploy Low-Frequency Spectrum for Wireless Broadband," (Washington, DC: New America Foundation, 2004).

B contour. Several commentors suggest that these entities be able to exclude anyone from using unlicensed devices in their immediate vicinity.

A far better and more cost effective solution exists, without requiring such exclusion. By 2006, all local TV stations are expected to be available via satellite. If a cable company or translator service needs to pick up a signal beyond the Grade B contour, it will be able to do this via satellite. Most individuals in a rural area who can afford to build a high structure with a directional antenna should also be able to afford a satellite dish.

In addition to satellite delivery of TV signals, other close substitutes are feasible. Broadcasters have rights to close to 4 GHz of spectrum for auxiliary service. Some of that could be used to link to translators and cable headends. If auxiliary spectrum were not available, then satellite time could be purchased, just like most companies who seek to communicate must pay for their own communications. Moreover, most broadcast and cable companies now have access to high speed Internet connections, which they use to feed video back and forth from their corporate headquarters and local stations or systems. Indeed, cable companies are now in the business of providing such high-speed two-way links to their customers, and any cable company that claims to need a broadcast feed under must-carry rules must have subscribers within a Grade B contour.

As described in the initial comments, the public interest clearly lies with maximizing public access to spectrum via Part 15 devices, rather than protecting a tiny minority of viewers at the margin of reception area – particularly when other options for television reception are available. Providing guard band spectrum to entities that could readily distribute their programming via other means is a gross misuse of spectrum.

D. If the FCC is uncertain about the opportunity cost analysis presented here, it should conduct a study to determine the market value of the spectrum accrued by the broadcasters since 1997 as a result of a variety of rulemakings to maximize broadcasters' geographic and population coverage. This should include a valuation for license modification to date as well as future license modifications allowed, under existing law or proposed in current FCC proceedings, when the DTV transition is complete.

In 1995 the FCC attached a market value to the 2nd channel "loaned" to broadcasters at up to $70 billion.[23] This became an important and legitimate part of the debate over whether broadcasters should be loaned that 2nd channel. However, the FCC has never attached a similar valuation to rights to expanded population coverage, although such a calculation would be no more difficult or controversial that that behind the $70 billion valuation.

NAF, *et al.* have submitted a sufficient analysis to allow the FCC to determine the opportunity cost to the public if it fails to adopt the *NPRM* while at the same time permitting broadcasters to further expand their use for the spectrum. If the Commission has any doubts, however, it should initiate its own study and resolve the matter. The cost

[23] Letter from Robert M. Pepper, Chief of the FCC's Office of Plans and Policy, to Senator Joseph I. Lieberman, May 5, 1995.

to the public is simply too great for the FCC to ignore the consequences of further expansion into the guard bands by licensees.

E. Permitting further modifications would violate the intent of the Communications Act.

This well-established pattern of "minor modifications" accumulating to billions of dollars of windfall should alarm the FCC not only on economic and moral grounds but also on legal grounds. The Communications Act prohibits windfalls to private parties. 47 US.C. 309(j)(3)(C). Indeed, Congress explicitly prohibited broadcasters from leveraging the transition to digital television for their own advantage. 47 USC 336(e)(2)(A). Congress also clearly contemplated that the FCC should consider other possible uses for the broadcast spectrum than simply handing it to broadcasters. 47 USC 336(f)(2). *Accord* Auction Reform Act of 2002, Pub. L. 107-195, Sec. 2(6)(B) (transition to digital TV should not create windfalls for broadcasters).

Since *Ashbacker Radio Corp. v. FCC*, 326 U.S. 327 (1945), it has been axiomatic that "the public, not some private interest, convenience, or necessity" is the touchstone of Commission policy. *Id.* at 333. In the broadcasting context, this has long been understood to mean that the Commission must carefully consider among possible applicants for use of spectrum what would best serve the public interest.[24] In light of the opportunity cost, continued expansion of broadcaster activity would impose on the public, the Commission should freeze broadcaster uses at their current generous levels and move expeditiously to permitting direct citizen access of the spectrum pursuant to Part 15.

F. Broadcasters have made no economic case for having the FCC warehouse or give to broadcasters guard band and underlay spectrum that belongs to the public and should be used to serve the public.

Since the late 1980s a stable of highly regarded economists and telecommunications policy experts have argued that broadcast service is a highly inefficient use of this band of spectrum.[25] Broadcasting has close substitutes with cable

[24] E.g., Joel Brinkley, *Defining Vision: The Battle for the Future of Television*, 1st U.S. ed. (New York: Harcourt Brace, 1997), Michael Dupagne and Peter B. Seel, *High-Definition Television: A Global Perspective*, 1st ed. (Ames: Iowa State University Press, 1998), Hernan Galperin, *New Television, Old Politics: The Transition to Digital TV in the United States and Britain, Communication, Society, and Politics* (New York: Cambridge, 2004), MSTV, "MSTV White Paper on Broadcaster Flexibility to Provide Additional Service Using New Technologies within Existing Spectrum Allocation," (Washington, DC: Association for Maximum Service Television, 4 April 1994). Of course, Congress has made substantial change to how to implement the *Ashbacker* principle, e.g., elimination of comparative hearings in minor modifications, exclusion of consideration of whether an alternate applicant would better serve the public interest, etc. But the basic principle of *Ashbacker*, that the Commission must consider benefit to the total public when evaluating who gets to access spectrum and under what rules, remains as true today as it did when *Ashbacker* was decided 60 years ago.

[25] E.g., Stewart Brand, The Media Lab: Inventing the Future at MIT (New York, N.Y.: Viking, 1987), George F. Gilder, Life after Television (Knoxville, Tenn.: Whittle Direct Books, 1990), Thomas W.

TV, satellite TV service, and soon Internet TV. It also offers comparatively little program choice, often a low quality signal and a high price in terms of required viewer time spent watching ads. All this is reflected in the steady decline for over-the-air reception of broadcast TV, with less than 15% of Americans now relying on this as their primary means of receiving TV.

The propagation characteristics of broadcast spectrum make it most suitable for portable, not fixed applications. One study indicates that the market value of broadcast spectrum is worth close to twenty times as much when used for non-broadcast services.[26]

No study disputes the claim that broadcasting, from the standpoint of market economics, is the least efficient use of the TV broadcast bands. In other words, there is a widespread consensus that what makes the broadcast band beachfront spectrum is not that it is used for broadcasting, but that it can be used for non-broadcast services. Any case for maintaining – let alone expanding – the broadcast service rests solely on its non-economic public interest value. *See, e.g., Turner Broadcasting System, Inc. v. FCC*, 520 U.S. 180 (1997) (public interest value of maintaining free over the air television system lies in service to local communities and in maintaining an informed citizenry).

Similarly, broadcasters have wholly failed to make a convincing case that additional use of low frequency spectrum for broadcasting addresses a compelling market failure. They have merely asserted, not made that case. In their NOI comments, broadcasters make a half-hearted attempt by citing two authors who had purportedly made the case for them. But the author of the primary study cited,[27] Roger Noll, ridiculed the claim they make in his name. In any case, whatever economic conditions may or may not have existed when his study was published in 1973, have changed dramatically since then. Again, only a public interest analysis demonstrating that ***expanded*** broadcaster use of guard bands could justify this continued expansion of rights. Yet, as demonstrated by NAF, *et al.* in the initial comments, the public interest heavily favors permitting direct citizen access to the band via Part 15 devices over limiting access to a few licensees.

Broadcasters have provided no evidence to dispute the fact that broadband Internet service is highly valued to Americans, that unlicensed service could reduce the cost and increase the utility of the last link in the broadband Internet network, and that portable use of low frequency spectrum is its best use because it has no close substitutes in the wired world. For example, people can plug their TV into a cable outlet with little loss in product utility, but they cannot attach a wire to their cordless phone, laptop computer, or garage door opener without drastically reducing their utility. Surely, numerous manufacturers would not be submitting comments to this proceeding if they didn't think unlicensed service would offer major new opportunities to decrease the cost and increase the utility of unlicensed service. Even broadcasters themselves acknowledge in their comments that there is a very real chance that consumers will

---

Hazlett, "The U.S. Digital TV Transition: Time to Toss the Negroponte Switch," (Washington, DC: AEI-Brookings Joint Center for Regulatory Studies, 2001), Bruce M. Owen, The Internet Challenge to Television (Cambridge, Mass.: Harvard University Press, 1999).

[26] Coleman Bazelon, Michael Rothkopf, and Troy Kravitz, "The Value of the Airwaves," in J.H. Snider, ed., *An Explanation of the Citizen's Guide to the Airwaves* (Washington, DC: New America Foundation, 2003).

[27] Roger G. Noll, Merton J. Peck, and John J. McGowan, Economic Aspects of Television Regulation, Studies in the Regulation of Economic Activity (Washington,: Brookings Institution, 1973).

purchase millions of unlicensed devices to use in this band. As Cox says in its comments: "The Commission has every reason to presume widespread commercial use of new unlicensed devices…."[28] Yet in response to this overwhelming evidence, the best MSTV/NAB can offer is the unsupported claim that benefits of unlicensed access in the band "are, at best, speculative."

Perhaps the best evidence of the seriousness with which the most sophisticated American telecommunications companies take unlicensed spectrum as a last-mile competitive threat is their fierce opposition to municipal wireless services. These networks, which typically use short haul unlicensed spectrum in a mesh network—for example, from lamppost to lamppost—and are cropping up all over the U.S.[29] These companies would not invest millions of dollars to pass legislation preventing unlicensed mesh networks from being deployed if they didn't anticipate that they could evolve into a viable, cost-effective competitor. Moreover, these wireless mesh networks would be a significantly greater competitive threat if the links between lampposts, telephone polls, or other short haul links didn't have to avoid trees and other obstacles that are common in city and suburban environments. The broadcast spectrum can provide such obstacle penetration in a way that the line of sight spectrum they propose as an equivalent substitute—the new 255 MHz of unlicensed spectrum in the 5 GHz band—simply cannot do. Strategy Analytics, Inc., a market research firm, predicts that local telephone operators will lose $12 billion in projected profits as low-cost or free WiFi services become increasingly available and cut into margins.[30]

G. The Broadcaster claims that proponents of unlicensed access have failed to prove their case is nothing more than a plea for additional spectrum subsidies at the public expense.

The broadcasters seek to place the burden of proof on those advocating for unlicensed service in the white space. As discussed at length in the initial comments, the burden of proof lies on the broadcasters to explain why the consistent determination of the Commission and of numerous outside experts that interference problems are surmountable is in error. At the same time, in asking the FCC to hold guard band and underlay white space in reserve for their own expected spectrum lebensraum, broadcasters are, in effect, seeking a multi-billion dollar public subsidy. But unlicensed use involves no public subsidy. It merely returns use of the airwaves to its rightful owners, the public.

---

[28] Comments of Cox Broadcasting Inc., November 30, 2004, p. 8.
[29] For a list of municipal wireless deployments, see www.muniwireless.com.
[30] Kurt, Mackie, "Analyst Predicts WiFi Will Cut Operator Profits," Broadband Wireless Online, January 31, 2005.

III. THE COMMISSION SHOULD ALLOCATE THE SPECTRUM WHITE SPACE WITH THE GOAL OF MAXIMIZING TOTAL SOCIAL WELFARE, NOT MINIMIZING HARM TO ADJACENT INCUMBENTS.

As a fall back strategy, the broadcasters seek to so encumber Part 15 devices using the broadcast bands with unnecessary safeguards and protections that deployment will become economically impossible. The Commission must therefore take particular care not to allow broadcasters to stop safe public access to broadcast spectrum via a "death by a thousand cuts" approach.

A. To the extent feasible, the Commission should avoid mandating particular interference mitigation technologies and instead mandate the degree of interference mitigation necessary to protect broadcasters.

The best technological means to protect broadcasters from harmful interference are not known and will likely change with evolving technology. To the extent possible, FCC rules should focus on the goal of protecting broadcasters from harmful interference and leave the means of accomplishing that goal to the marketplace.

B. If the Commission requires interference mitigation strategies, it should be careful not to be overly protective of incumbents, thus needlessly raising the cost of unlicensed devices.

Obviously, as many commentors argued, interference protection is increased as the number of interference avoidance technologies are included in unlicensed devices. But there is a real danger that mandating a redundant and failsafe set of interference avoidance technologies will increase the cost and decrease the utility of unlicensed devices to the point that the market for them is either significantly reduced or eliminated altogether. In deciding whether to mandate one or more specific interference avoidance technologies, the Commission must always remember that its mandate is to maximize total social welfare and not just minimize interference to broadcasters.

An analogy here will help us make our point. Every day the government allows people to drive cars, fly airplanes, and socialize with people in public spaces. Several of these activities results in thousands of deaths per year. People die in car crashes, die in airplane crashes, and die from communicable diseases picked up unknowingly from others. But as a society we deem the total utility from allowing people to drive, fly, and publicly interact with each other to be greater than the cost in lost life. And with the case of TV, the downside is much less. No one is arguing there will be lost lives. In many cases, only a small minority of the population could be at risk of losing a TV signal on a single channel; for a brief period of time; for a product that has affordable close product substitutes through cable, satellite, the Internet, and even other broadcast stations, some of which broadcast identical programs, as in the overlapping Baltimore-Washington, DC markets. No one is saying that some TV reception might be lost—just as when someone

builds a high-rise building, it may block TV reception for those behind it. But we don't ban building construction for that reason. Similarly, we must weigh the cost of a statistically small number of lost viewers against the benefit of bringing to America low-cost, high speed broadband Internet service, which offers viewers the promise of zero marginal cost ("free") content (most Internet content is "free" in the sense that local broadcast TV content is free), infinite choice in programming, including truly local programming, and the convenience of watching programming when and where the viewer wants. Only through such a service will the promise of anytime, anywhere, anything TV—the holy TV grail of the information age—be made possible. And the most efficient way to provide the last link of such a network is through unlicensed spectrum.

Lastly, if broadcasters advocate that the FCC adopt a zero tolerance policy for lost over-the-air viewers—they must explain how this policy is consistent with their never ending activities to upgrade the broadcast DTV standard—with the effect that early purchasers of DTV equipment are disenfranchised. In its Second Periodic Review, the FCC acknowledges that some loss of service to existing TV viewers is the inevitable price of progress; indeed, it is the sine qua non of the information revolution.[31] The same standard that looks at total public utility, not the utility of a particular user, should be applied here.

C. If the Commission requires a particular interference mitigation method for low power devices, we strongly object to the control signal approach and prefer the sensing approach.

The control signal approach is rife with incentives for opportunistic behavior by the incumbent licensees with control over the signal. As we have seen, broadcasters have a decades long track record of seeking to warehouse guard band spectrum and prevent new entrants from using it unless it redounds to their own benefit. In saying this, we intend nothing disrespectful to the broadcasters. We are merely saying that broadcasters have rationally responded to the incentives presented to them.

The risk of control signal opportunism could be mitigated if the control signal was mandatory, not voluntary, as proposed in the NPRM. But even if mandatory, the underlying incentives would not change, making credible enforcement critical. But it would be hard for the FCC to enforce such a mandate across all primary services in a given geographical area. The FCC is not even aware of the power levels with which broadcasters are transmitting their DTV signals. How can it then be expected to track the accuracy of control signals? And with the possible proliferation of control signals across distributed transmission broadcasts and other users, such as wireless mics, the lack of a credible enforcement mechanism will become that much more severe. In a world where control signals become the critical arbiter of spectrum property rights, one can expect endless lobbying to modify the use and enforcement of control signals to the benefit of the incumbents who control them.

---

[31] FCC, "Second Periodic Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television," MB Docket No. 03-15, released September 7, 2004..

The advantage of the sensing approach is that it is more decentralized than either the control signal or geolocation approaches, and thus more consistent with the FCC's move away from command and control regulation of the spectrum. As Microsoft and other commentors have noted, it can also be highly effective, especially for portable unlicensed devices.

D. The Commission should not endorse high power unlicensed devices at the expense of low power devices.

We applaud the Commission's effort to increase the power levels of unlicensed devices where appropriate. For example, it is highly inefficient not to allow increased unlicensed power levels when one is in a boat in the middle of Lake Michigan or in rural Wyoming. But the Commission should be careful not to allocate high power unlicensed service at the expense of low power unlicensed service. High powered service must be thought of as a complement, not a substitute, to low powered service.

E. The Commission should treat wireless mic and WAVD devices under the same rules as low power portable unlicensed devices.

Wireless mics and WAVD devices make extremely inefficient use of the spectrum. At any one time and place, less than a billionth of the spectrum allocated to such devices is in use. NAF, *et al.* recognize the service they provide to big events such as football games, breaking news, and theatrical performances. But to block use of all this spectrum for these events narrowly targeted in space and time is excessive restraint of speech and commerce in an age of smart radios. It would be like cutting out the voice box (larynx) of theater goers to prevent them from interrupting a performance. There are less onerous means of achieving the same end. One commenter notes the harm from wireless LANs to wireless mics at a national party convention. But then notes the simple solution of asking the wireless LAN to shut down if the convention organizers, who control the building, deem the wireless mics of greater priority. To counter this argument, another commenter says the wireless LAN might be locked in a room that the event organizers cannot access. To this the best reply is that the event organizers should check for any such devices as part of their due diligence in picking an event site. To prevent the vast majority of Americans from using unlicensed devices because event organizers have not conducted adequate due diligence violates accepted social welfare and First Amendment values. As one commenter put it:

> The basic problem here is that broadcasters and certain other entertainment-related industries have been given preferential treatment compared to all other possible users in access to UHF-TV spectrum on what is de facto an unlicensed basis for wireless microphones and even short range video…. Why a Hollywood-based movie production company has special knowledge about TV spectrum in

Iowa that allows it to use the spectrum but forbids most Iowa residents to use the spectrum has always puzzled me.[32]

F. The Commission should make portable devices a high priority and should not endorse fixed unlicensed devices at the expense of portable unlicensed devices.

The primary long-term value of wireless over wired communication is that it allows portability. This is also true of unlicensed devices. To mandate that only fixed unlicensed devices be allowed in this band would cripple the potential of this spectrum, which no one disputes is considered beachfront spectrum specifically because of its special ability to support portable services.

G. The Commission should not label as "unlicensed" a service that in fact requires site-based licensing on a first-come, first-served basis or any other basis.

We recognize that as power levels increase, the pressure to create so-called "lite licensing rules" also increase. The FCC must draw the line at any regulatory scheme that involves first-come, first-served protections for incumbents. We reject any claim that such schemes should fall under the rubric of unlicensed service. They are nothing more than the site-based licensing system of old, which have been much disparaged in other FCC proceedings as incumbents with site-based licenses jockey for geographic service area licenses.

H. Peer-to-peer equipment should not be required to have the full complement of interference mitigation technologies required of a base station.

In a typical unlicensed network configuration, unlicensed devices are part of a network attached to a base station. In such a configuration, it should not be necessary that each device on the network have a full complement of interference mitigation technologies. In a home network, for example, any requirement should only apply to the central router linking the network to the external network. All the low power devices within the home—and it is possible that one day there could be hundreds or thousands of such devices in a home—should have no such burdensome requirement.

[32] Comments, of Mike Marcus, pp. 7-8.

CONCLUSION

The Commission has before it an opportunity to open vital spectrum to the broadest public use. This stands in marked contrast to the history of the band, wherein spectrum management has benefited only a handful of incumbent licensees. The Commission should therefore move expeditiously to adopt the *NPRM*, so that the benefits of spectrum access can be shared broadly by all Americans.

Respectfully submitted,

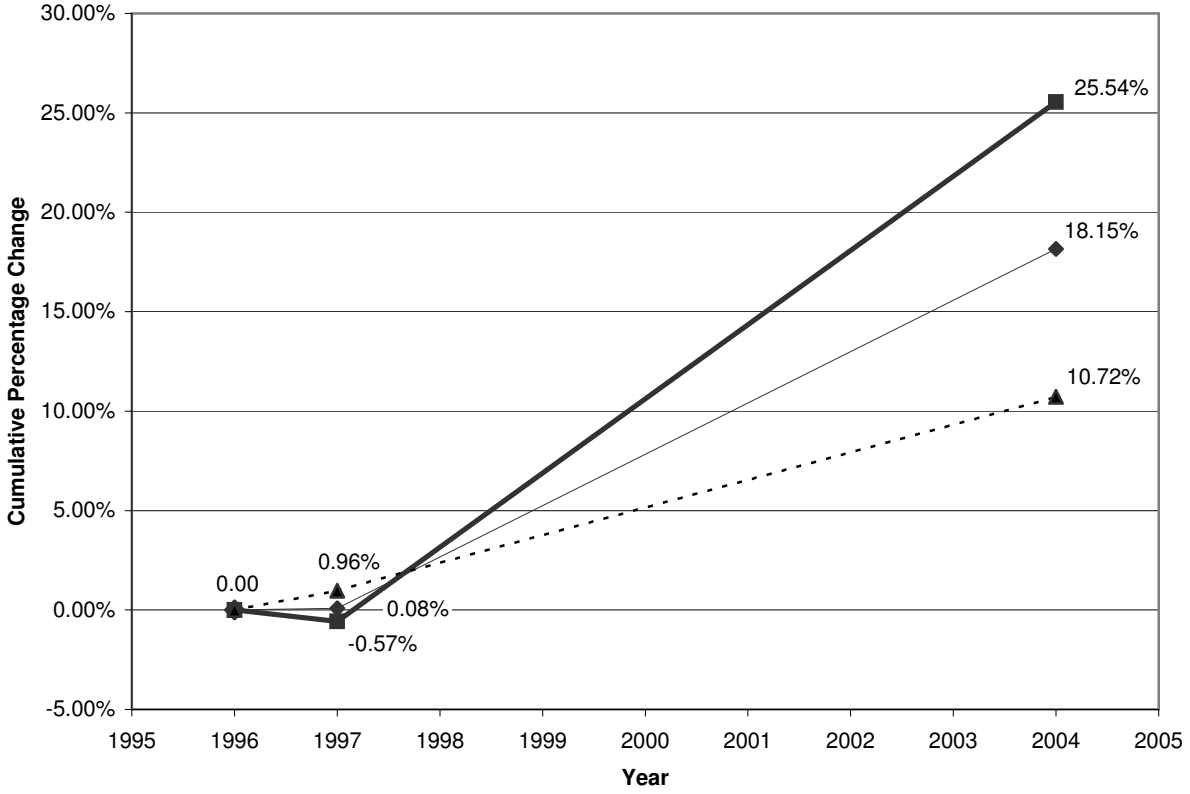
J.H. Snider
Michael Calabrese
New America Foundation
Spectrum Policy Program
1630 Connecticut Avenue, NW
7th Floor
Washington, DC 20006
(202) 986-2700

Harold Feld
Andrew Jay Schwartzman
Media Access Project
1625 K St., NW
Suite 1118
Washington, DC 20009
(202) 232-4300
Counsel for NAF, et al.

January 31, 2005

APPENDICES

Appendix 1: Change in Total Population Covered by Analog and Digital TV Stations compared to Change in US Population (%)



Data

Table 1: TV Station Population Coverage and US Population

Year	Analog Stations	Digital Stations	US Population
1996	2,593,211,000	2,753,985,000	265,229,000
1997	2,595,376,000	2,738,292,000	267,784,000
2004	3,063,880,435	3,457,371,605	293,655,404

Table 2: Cumulative Percentage Change in TV Stations Population Coverage and US Population

Year	Analog Stations	Digital Stations	US Population
1996	0.00%	0.00%	0.00%
1997	0.08%	-0.57%	0.96%
2004	18.15%	25.54%	10.72%

Analog Stations
Digital Stations
US Population

Explanation of Broadcasters' Encroachment into Guard Space

Power Levels: When power levels increase, broadcasters eat into co-channel guard space, so that less spectrum is available for unlicensed use. Despite this, UHF broadcasters got power levels ranging from 50KW to 1000kW in 1998, in the Memorandum Opinion and Order on Reconsideration of the Sixth Report and Order (Docket 87-268). This trend is likely to continue for several reasons: a) as of December 2004 FCC data, several hundred requests for increased power had not yet been processed, and b) at the end of the DTV transition, broadcasters get another chance to increase their power levels as half of the high powered channels are returned to the public.

Coverage Area: In addition to increases in power levels, all broadcasters got to increase their coverage from 50% of locations 50% of the time to 50%of the locations 90% of the time (FCC, "Appendix A: Rule Changes," Fifth Report and Order, MM Docket No. 87-268, FCC 97-116, April 22, 1997).

Other Changes in population coverage not represented on this chart: In addition to over-the-air territory, broadcasters have, through "must-carry," secondary rights to cable and satellite distribution, which increases their coverage even further.

Broadcasters' Likely Encroachment in the Future: It is likely that with the advent of distributed broadcast networks (a cellular architecture), mandatory digital receiver standards, and adoption of new interference mitigation models, broadcasters will be able to expand their coverage even further.

Data Sources:

Population Covered by TV Stations: 2004: FCC, "Table of Station Assignment and Service Information," December 21, 2004; 1997: FCC, "DTV Table of Allotments," Sixth Report and Order, MM Docket No. 87-268, FCC 97-115, April 21, 1997; 1996: FCC, "Appendix B: Proposed DTV Table of Allotments," Sixth Further Notice of Proposed Rulemaking, MM Docket No. 87-268, FCC 96-317, August 14, 1996.

US Population: 2004: U.S. Census Bureau, "Table 1: Annual Estimate of the Population of the United States and States and Puerto Rico: April 1, 2000 to July 1, 2004," December 22, 2004, available at: http://www.census.gov/popest/states/tables/NST-EST2004-01.pdf; 1996 and 1997: U.S. Census Bureau, "Resident Population Estimates of the United States by Age and Sex: April 1, 1990 to July 1, 1999, with Short-Term Projection to November 1, 2000," January 2, 2001, available at: http://www.census.gov/popest/archives/1990s/nat-agesex.txt

Appendix 2: Chronology of High Power Metropolitan Area Broadcasters' Acquisition of Guard Space

August 14, 1996 — In its Sixth Further Proposed Notice of Rulemaking in the DTV proceeding (Docket 87-268), the FCC proposes expanded geographic areas for TV stations

April 22, 1997 — In its Sixth Report and Order in the DTV proceeding (Docket 87-268), the FCC implements the proposed expansion of geographic areas in its DTV allotments. It establishes the following important principles and technical specifications:

- Maximization: Recommended by the NAB, MSTV and the Broadcast Caucus, the Commission adopted the principle of "maximization," which allows TV stations to both enlarge their service areas and to intensify coverage within their service areas
- Power: Power levels for UHF DTV stations are set at a minimum of 50 kW and a maximum of 1000 kW; moreover, stations can increase their geographic area by increasing their power, up to the Grade B contour of the largest TV station in the market
- Antenna Height: TV Stations are permitted to request increases in their antenna height so that they can provide greater service

February 18, 1998 — In its Memorandum Opinion and Order on Reconsideration of the Sixth Report and Order in the DTV proceeding (Docket 87-268), the FCC further expands the geographic areas for TV stations, especially UHF broadcasters, who receive a massive increase in acceptable power levels.

November 19, 1999 — Broadcasters block satellite companies from serving customers that receive their TV signal even beyond broadcasters' Grade B contours in the Satellite Home Viewer Improvement Act. Five years later, the National Translator Association, which represents many local TV broadcasters, tries to use this expanded notion of protected coverage to block citizens' access to new technologies.

June 12, 2000 — In the Report and Order in the medical telemetry proceeding (Docket 99-255), broadcasters get to kick off the medical telemetry devices from the broadcast bands to make way for broadcasters' second TV channel. Medical telemetry devices are used to relay vital patient information in hospitals to monitor the health of patients.

How Broadcasters Displaced One Hospital's Life-Saving Techniques

On February 27, 1998, twelve heart monitors at the Baylor University Medical Center shut down after a local TV station started broadcasting in digital on a brand new channel that it received as part of the DTV transition. Luckily, no one was injured when these life-saving devices shut down, though the hospital had to spend almost $200,000 just so that its heart monitors would not interfere with a few television sets.

Source: "Dallas Heart Monitor Failure Could Point to DTV Problems," *Communications Daily*, March 5, 1998; Jon Asplund, "Heart-Stopper in the Cardiac Unit," *Materials Management in Health Care*, 7(5): May 1998, p. 18.

November 13, 2002 — In the Report and Order in the broadcast auxiliary services proceeding (Docket 01-75), broadcasters and producers get a sweetheart deal to use WAVDs under Part 74. Broadcasters (along with cable and Hollywood producers) petition for, and win, the right to use the guard band space for wireless assist video devices (WAVDs), including the right to rent this service out to third parties. WAVDs are used by production crews to transmit low resolution video images during movie or television production.

August 3, 2004 — The FCC freezes the filing of certain TV and DTV requests for allotment or service area changes.

September 7, 2004 — In its Report and Order of the second DTV periodic review (Docket 03-15), the FCC grants broadcasters the right to elect which channel they keep after the DTV transition.

Appendix 2: Chronology of High Power Metropolitan Area Broadcasters' Acquisition of Guard Space (continued)

September 30, 2004 In the Report and Order on digital service rules for LPTV and TV translator stations (Docket 03-185), TV translator stations get expanded rights that high power broadcasters gained in 1997, as well as additional rights. Some of the rights that high-power broadcasters got in 1997 that are extended to TV translators include: rights to a second channel; the right to increase their service levels by up to 20 times; the right to provide non-broadcast services on their existing channel; and the right to abandon the free TV business on the vast majority of their spectrum. TV translators also get new rights: no fixed deadline (at least as yet); the right to multiplex SDTV from single TV translators in a single market and use the balance of the channels for any type of non-broadcast service they want by converting to an "LPTV" station. TV translators are owned by a diverse group of entities, including commercial broadcasters. LPTV and translator stations are now starting to expand their coverage areas, in some cases by a factor of ten or more.

December 21, 2004 The FCC publishes new station information data, including population and area covered by analog and digital TV stations, to assist broadcasters in choosing which station they would like to keep. This information is released after the November 30, 2004 comment filing deadline in this NPRM. (Note: several hundred stations have pending power increases that are not reflected in the population and area covered.)

February 10, 2005 By an Order in Docket 03-15 (DA 05-164), the FCC extended the channel election deadline, where broadcasters with two channels within the 2-51 core get to elect which of the two they keep after the DTV transition

Appendix 3: Chronology of High Power Metropolitan Area Broadcasters' Warehousing of Spectrum

April 21, 1997

In its Fifth Report and Order (Docket 87-268), the FCC establishes the following construction deadlines: By May 1, 1999, network affiliates in the top 10 markets must complete construction; network affiliates in markets 11-30 must do so by November 1, 1999; all remaining commercial stations must complete construction by May 1, 2002, while all noncommercial stations must do so by May 1, 2003

February 23, 1998

In its Memorandum Opinion and Order on Reconsideration of the Sixth Report and Order (Docket 87-268), the FCC makes three important findings regarding power levels: 1) it clarifies that 50 kW is not the minimum power level that broadcasters are required to operate on, but rather the minimum assigned power level (broadcasters are welcome to operate at levels below this, if they so choose), 2) UHF DTV stations can request increases in their power levels up to 200 kW to "maximize" their service areas, and 3) UHF DTV stations can request increases in their power levels up to 1000 kW if they use beam-tilting techniques.

December 18, 1998

In its Second Memorandum Opinion and Order on Reconsideration of the Fifth and Sixth Reports and Orders (Docket 87-268), the FCC allows UHF digital broadcasters to increase their power level up to 1000 kW so long as they meet the Commission's new 2% de minimis interference standard.

May 1, 1999

In its Fifth Report and Order (Docket 87-268), the FCC sets this date as the DTV facilities construction deadline for network-affiliated stations in top ten television markets.

November 1, 1999

In its Fifth Report and Order (Docket 87-268), the FCC sets this date as the DTV facilities construction deadline for network-affiliated stations in television markets eleven to thirty.

November 15, 2001

Broadcasters succeed in their goal of warehousing unused spectrum, enabling them to reduce costs while holding out for a future windfall. In its Memorandum Opinion and Order on Reconsideration (Docket 00-39), the FCC:

- allows broadcasters to operate at low power so that they serve only their "community of license," while maintaining their rights to the entire "maximization" service area, even if unserved
- delays two major deadlines until the next periodic review of the transition: first, the deadline by which broadcasters have to choose their digital channel, and second, the deadline by which broadcasters have to replicate their chosen service area. For broadcasters who cannot meet minimum operating requirements (which were also reduced in this order), they may seek further extensions of the deadline
- allows broadcasters to operate their digital stations only at prime time

In other words, broadcasters pursue a simultaneous strategy of maximizing their future revenues by expanding their geographic rights, while minimizing their present costs by warehousing the spectrum until the broadcast DTV transition reaches takeoff.

April 23, 2002

In a report titled "Many Broadcasters Will Not Meet May 2002 Digital Television Deadline," the GAO finds that ten days before the digital facilities construction deadline, only 185 out of 1,121 stations are broadcasting in digital (GAO-02-466).

May 1, 2002

DTV facilities construction deadline for all remaining commercial stations.

February 6, 2003

More than three years after the deadline to construct digital facilities, network-affiliated broadcasters in the top ten markets continue to seek additional extensions to the construction deadline. (See FCC 03-22, Order, February 6, 2003.)

Appendix 3: Chronology of High Power Metropolitan Area Broadcasters' Warehousing of Spectrum (continued)

May 1, 2003

DTV facilities construction deadline for all noncommercial stations.

October 17, 2003

A study conducted by BIA Financial Network for MSTV finds that over 80% of the 517 digital stations operating under Special Temporary Authorizations (STAs) are not broadcasting with sufficient signal strength to replicate their analog population coverage. By operating at lower power, broadcasters provide a fraction of the service they are supposed to, while claiming that they are "using" these channels. (Mark R. Fratnik, "Reaching the Audience: An Analysis of Digital Broadcast Power and Coverage," October 17, 2003.)

December 31, 2003

Deadline for channel election established by the FCC's Report and Order in the First Periodic DTV Review (Docket 00-39) on January 18, 2001. This deadline was then postponed by a Memorandum Opinion and Order (see November 15, 2001), and set to begin in December 2004 by the FCC's Report and Order in the Second Periodic DTV Review (Docket 03-15) of September 7, 2004.

May 25, 2004

In comments filed for the Notice of Inquiry in Docket No. 02-380, broadcasters push to warehouse underlay spectrum in the broadcast bands by claiming that there are virtually no parts of the broadcast bands that are unused. Broadcasters suggest that the Commission should delay allowing new technologies to use unused spectrum until after the DTV transition.

> *"Now is not the time to consider introducing new, untested and largely uncontrollable devices into theoretically "unused" portions of the broadcast band..."*
>
> Source: Joint Comments of NAB/MSTV/APTS, Docket 02-380, Notice of Inquiry

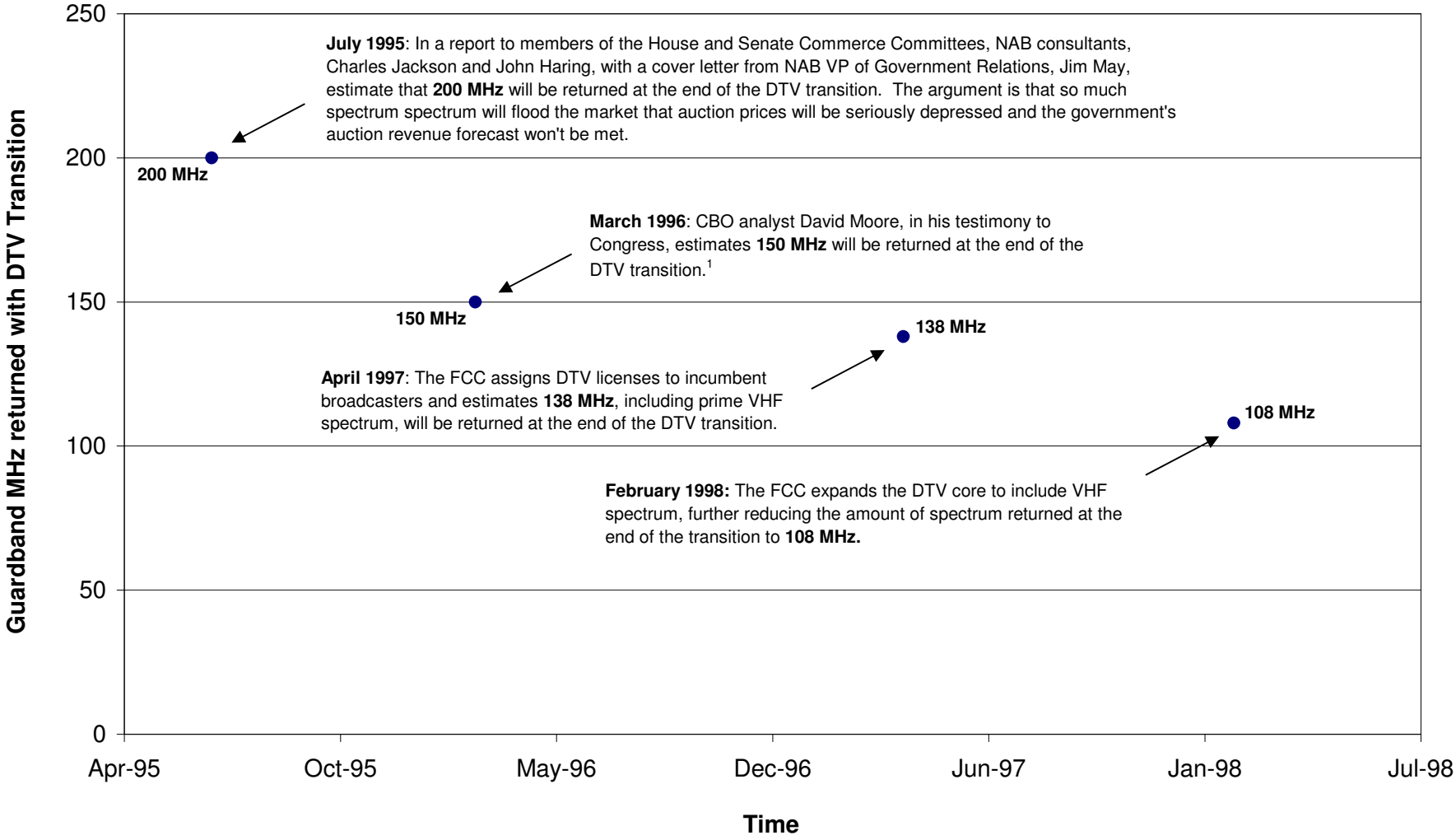
July 28, 2004

The FCC's Report and Order in the Second DTV Period Review (Docket 03-15) finds that as of this date - more than two years after the construction deadline - 212 commercial television stations are yet to begin broadcasting in digital.

December 31, 2004

Initial deadline by which broadcasters had to replicate the population covered by their analog stations, by order of the FCC's Report and Order in the First Periodic DTV Review (Docket 00-39) on January 18, 2001. This deadline was then postponed by a Memorandum Opinion and Order (see November 15, 2001), and set for July 1, 2005 for commercial broadcasters in the top 100 markets, and July 1, 2006 for all other stations, by the FCC's Report and Order in the Second Periodic DTV Review (Docket 03-15) of September 7, 2004.

Appendix 4: Change in Guardband MHz Returned with DTV Transition over Time



Notes:

1. In a letter dated May 5, 1995 from Ropert Pepper, Chief, FCC Office of Plans and Policies, to Senator Joseph Lieberman, Pepper says: "We believe that if digital licenses are repacked, over 150 MHz of contiguous spectrum could be recaptured." He did not modify this estimate on a subsequent letter to Senator Lieberman on September 6, 1995: "none of the major factors used in our estimation have changed since our analysis. As late as 2000, FCC Chair Kennard would say: "The problem that we have right now is that the broadcast community is sitting on 150 megahertz of prime beachfront property - that is a public resource that is lying fallow." (See Frank Saxe, "Digital Age Airwaves Battle Begins: Spare Spectrum Due to Digital TV Conversions May Be Key to Expansion of Wireless Industry," Billboard, December 23, 2000.

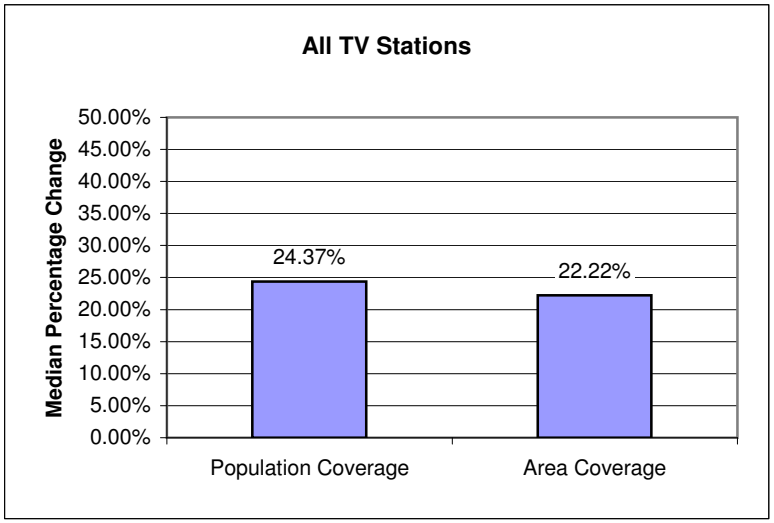
Sources: 1995: Charles L. Jackson and John Haring, "The Pitfalls in the Economic Valuation of the Electromagnetic Spectrum," (Washington, DC: Strategic Policy Research), July 19, 1995, p. 10; 1996: David Moore, Statement on Digital Television, *CBO Testimony before the Committee on the Budget, US Senate*, March 14, 1996; 1997: FCC, Sixth Report and Order, *In the Matter of Advanced Television Systems and their Impact on the Existing Broadcast Service*, Docket MM 87-268, April 21, 1997; 1998: FCC, Memorandum Opinion and Order on Reconsideration of the Sixth Report and Order, *In the Matter of Advanced Television Systems and their Impact on the Existing Broadcast Service,* Docket MM 87-268, February 23, 1998

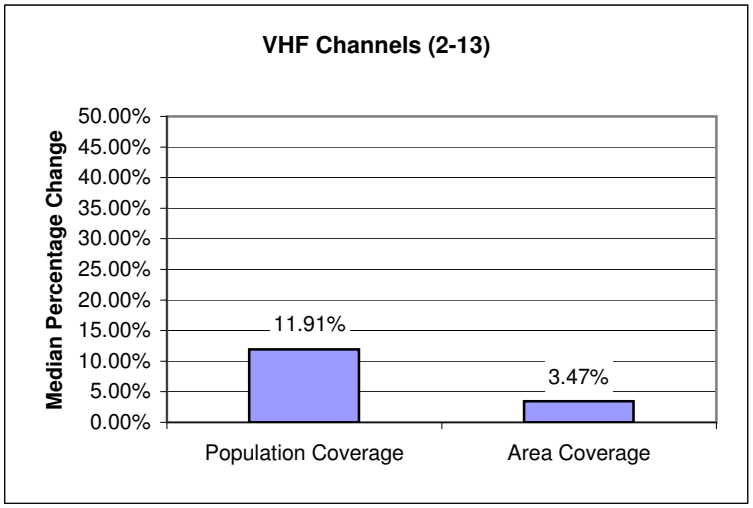
Appendix 5: Top Ten Increases in Population Covered by Switching from an Analog Channel to a Digital "Replication" Channel: 2004

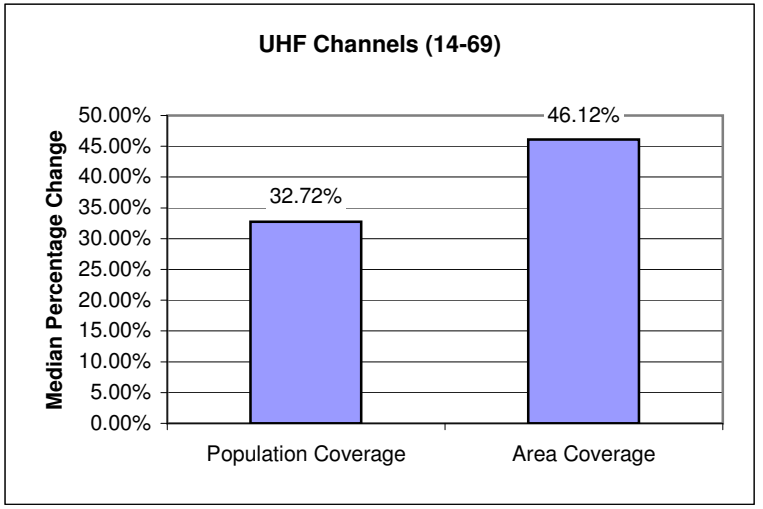
Rank	City	NTSC Channel #	Increase in Population Covered (%)	Increase in Area Covered (%)
1	Holbrook, AZ	11	12,886%	1,820%
2	Springville, NY	67	5,754%	1,793%
3	Cheyenne, WY	33	3,160%	248%
4	Bad Axe, MI	35	1,333%	276%
5	Manteo, NC	4	1,293%	103%
6	Beattyville, KY	65	1,165%	487%
7	Laughlin, NV	34	1,117%	693%
8	Pullman, WA	24	863%	522%
9	Burlington, IA	26	857%	646%
10	Ventura, CA	57	772%	157%

Calaculations based on Data from: FCC, "Table of Station Assignment and Service Information," December 21, 2004, available at: http://www.fcc.gov/mb/video/tv.html

Appendix 6: Change in Total Population and Area Covered from Analog TV Stations to Digital TV Stations in 2004 (%)[1]







[1] Analog Population coverage in 2004 is computed using 1996 analog population coverage as the base and adjusting for the natural growth in US population between 1996 and 2004. For example, total analog population coverage in 1996 was 2.59 billion. Assuming that population coverage grew at the pace of US population growth, total analog population coverage in 2004 would be: 2.59 billion + (2.59 billion x 10.72%) = 2.78 billion, where 10.72% is US population growth between 1996 and 2004.

Sources: Station Coverage: 2004: FCC, "Table of Station Assignment and Service Information," December 21, 2004, available at: http://www.fcc.gov/mb/video/tv.html; 1996: FCC, "Appendix B: Proposed DTV Table of Allotments," Sixth Further Notice of Proposed Rulemaking, MM Docket No. 87-268, FCC 96-317, August 14, 1996; US Population: 2004: U.S. Census Bureau, "Table 1: Annual Estimate of the Population of the United States and States and Puerto Rico: April 1, 2000 to July 1, 2004," December 22, 2004, available at: http://www.census.gov/popest/states/tables/NST-EST2004-01.pdf; 1996: U.S. Census Bureau, "Resident Population Estimates of the United States by Age and Sex: April 1, 1990 to July 1, 1999, with Short-Term Projection to November 1, 2000," January 2, 2001, available at: http://www.census.gov/popest/archives/1990s/nat-agesex.txt

Appendix 7: Opportunity Cost of Broadcasters' Acquisition of Guard Space

Digital Television Coverage			
Total Digital Population Coverage (2004, current)[1]			3,457,371,605
Analog Television Coverage			
Total Analog Population Coverage (1996, baseline):			
1996 Total Population Coverage by Analog TV Stations[2]		2,593,211,000	
Increase in Analog Population Coverage due to US Population Growth (1996-2004)	(+)	277,992,219	
Total Analog Population Coverage, Adjusted for US Population Growth (2004, adjusted)[4]		2,871,203,219	(-) 2,871,203,219
Increase in Population Coverage from Analog to Digital in 2004			**586,168,386**
# of MHz per Television Channel		6 MHz	
$ Value per MHz per Person[5]		$1.70	
$ Value per Channel per Person		$10.20	
Total Value of Increased Population Coverage from Analog to Digital ($ Value per Channel per Person x Increase in Population Coverage from Analog to Digital = $10.20 x 586,168,386)			**$5,978,917,535**

Notes

1. Sum of the population covered by all digital television stations (note: the large number is due to the presence of about 10 television stations in each market). (FCC, "Table of Station Assignment and Service Information," December 21, 2004, available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-04-3922A2.pdf)
2. FCC, "Appendix B: Proposed DTV Table of Allotments," Sixth Further Notice of Proposed Rulemaking, MM Docket No. 87-268, FCC 96-317, August 14, 1996.
3. 2004: U.S. Census Bureau, "Table 1: Annual Estimate of the Population of the United States and States and Puerto Rico: April 1, 2000 to July 1, 2004," December 22, 2004, available at: http://www.census.gov/popest/states/tables/NST-EST2004-01.pdf; 1996: U.S. Census Bureau, "Resident Population Estimates of the United States by Age and Sex: April 1, 1990 to July 1, 1999, with Short-Term Projection to November 1, 2000," January 2, 2001, available at: http://www.census.gov/popest/archives/1990s/nat-agesex.txt
4. 1996 analog television population coverage adjusted for population growth between 1996 and 2004. Actual analog television population coverage itself increased at a faster rate that US population growth (see Appendix 1).
5. This figure is based on a written commitment to the FCC by Verizon Wireless in April 2004 to start bidding for 10 MHz of spectrum at $5 billion, and the U.S. Census Bureau's estimate in July 2004 that US population was 293 million (Verizon Wireless, “Valuable Spectrum Auction Would Raise Minimum $5 Billion for U.S. Treasury,” Press Release, April 8, 2004). Verizon Wireless made the offer in response to fears that the FCC might undervalue the spectrum that it would give Nextel in the 1.9 GHz band. A study completed for Verizon Wireless by Kane Reece Associates also found that the "fair market value" of those 10 MHz was $5.28 billion (Communications Daily, October 28, 2003, p. 5). The FCC eventually valued the spectrum at $4.8 billion (Communications Daily, "Nextel Gets 1.9 GHz Spectrum But Must Pay Billions," July 9, 2004).